Original Article

Hip Arthroscopy Procedural Volume Is Low Among Graduating Orthopaedic Surgery Residents

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Purpose: The purpose of this study was to evaluate case volume and variability of hip arthroscopy exposure among graduating orthopaedic residents. **Methods:** The Accreditation Council for Graduate Medical Education (ACGME) surgical case log data from 2016 to 2020 for graduating United States orthopaedic surgery residents were assessed. Arthroscopy procedures of the pelvis/hip were identified. The average number of cases performed per resident was compared from 2016 to 2020 to determine the percent change in case volume. The 10th, 30th, 50th, and 90th percentiles of case volumes from 2016 to 2020 were presented to demonstrate case volume variability. **Results:** There was no change in the number of hip arthroscopy procedures between 2016 and 2020 [average: 8.4 ± 10 (range: 0 to 87) vs. 9.8 ± 12 (range: 0 to 101)] ($P = .995$). There was a wide variability in case volume among residents. The 90th percentile of residents performed 24 cases in 2020, compared to 2 cases in the 30th percentile and 0 cases amongst the 10th percentile of residents. **Conclusions:** Despite the growing popularity of hip arthroscopy, resident exposure to this highly technical procedure remains limited, with about one-third of residents performing 2 or less cases by graduation. **Clinical Relevance:** Understanding case volume and variability is important for orthopaedic surgery programs to ensure that graduating residents are gaining adequate exposure.

Introduction

Substantial changes in orthopaedic surgery residency education have occurred in the last decade. In 2013, the Accreditation Council for Graduate Medical Education (ACGME) implemented a new accreditation system for graduate medical education in the United States.[1] Seven specialties, including orthopaedic surgery, have since adopted the Next Accreditation System (NAS).[2] Although the traditional accreditation process focused on the details of process and administration, the NAS focuses more on continuous monitoring of measurable and meaningful outcomes of resident training.[1,2]

Procedural experience is among the most heavily weighted factors used by the ACGME to define program performance.[2] As such, resident case logs have become a critical element of the NAS data analysis[2] and are frequently monitored to ensure adequate procedural volume and case variety among residents for their given year of training.[3] Previous studies have assessed case volume and variability of various orthopaedic procedures.[4-10] However, continued analyses are critical for implementing standardized training expectations that reflect changes in the orthopaedic landscape and reduce discrepancy in resident education.[11]

Hip arthroscopy is one of the fastest growing areas of orthopaedic surgery.[12,13] However, there is a lack of a formal hip arthroscopy curriculum at both the resident and fellowship level.[14] This raises concern that early-career arthroscopists may struggle with performance[15] given the technical demands of hip arthroscopy and its prolonged learning curve.[16-19]

Despite the growing popularity of hip arthroscopy,[12] little is known about resident exposure to this

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technically demanding procedure. The purpose of this study was to evaluate case volume and variability of hip arthroscopy exposure among graduating orthopaedic residents. We hypothesize that case volume has remained low over the past 5 years and that wide variability in case volume is present among residents.

Methods

The ACGME case log reports for graduating orthopaedic surgery residents were reviewed from 2016 to 2020. The ACGME presents national averages of several procedures within particular anatomic categories using Current Procedural Terminology (CPT) codes. Procedures include incision, excision, intro or removal, repair/revision/reconstruction, trauma, fracture/dislocation, manipulation, arthrodesis, amputation, and arthroscopy. Anatomic categories include shoulder, humerus/elbow, forearm/wrist, hand/fingers, pelvis/hip, femur/knee, leg/ankle, and foot/toes. In this study, we assessed the mean number of total (adult and pediatric) arthroscopy cases performed per resident listed under the "pelvis/hip" ACGME case category from 2016 to 2020 to determine a percent change in volume. The CPT codes and definitions for each arthroscopy procedure within the "pelvis/hip" ACGME case category are provided in Table 1. In addition, the 10th, 30th, 50th, and 90th percentiles of case volumes from 2016 to 2020 were presented to demonstrate case volume variability.

The mean case volumes reported per resident were compared using unpaired 2-tailed *t* tests. The level of statistical significance was designated as $P < .05$. Excel software, version 16.0 (Microsoft Corp., Redmond, WA) was used for data input and statistical tests.

Results

The total number of orthopaedic surgery residency programs was 153 (705 residents) in 2016, 156 (709 residents) in 2017, 154 (729 residents) in 2018, 154 (725 residents) in 2019, and 154 (724 residents) in 2020 (Table 2).

The average number of total "pelvis/hip" procedures performed per resident was 216.1 ± 67 (median: 205; range: 80-487) in 2016, which increased to 248.9 ± 72 in 2020 (median: 241; range: 104-552), representing an 11.5% increase ($P < .001$) (Table 3). The average number of "pelvis/hip" arthroscopy procedures performed per resident in 2016 was 8.4 ± 10 (median: 5; range: 0-87), which increased to 9.8 ± 12 in 2020, representing a 16.7% increase ($P = .995$) (Table 3). Case volume for the total number of pelvis/hip procedures and the total number of arthroscopy procedures of the pelvis/hip performed per resident during the study period are depicted in Fig 1.

There was a low level of variability in the total number of pelvis/hip procedures and a wide level of variability in pelvis/hip arthroscopy case volume among residents over the study period (Fig 2). The average number of total pelvis/hip cases performed by the 10th percentile and 90th percentile of residents was 141 and 299 in 2016, representing a 2.12 fold difference, compared to 164 and 347 in 2020, which also represents a 2.12 fold-difference (Table 4).

The average number of pelvis/hip arthroscopy cases performed by the 10th percentile and 90th percentile of residents was 0 and 22 in 2016, respectively, compared to 0 and 24 in 2020 (Table 4). Roughly 1 of every 10 residents failed to perform a single hip arthroscopy case each year of the study period, and about one-third performed 2 cases or less (Table 4).

Table 1. CPT Codes with Description of Arthroscopy Procedures for the Hip/Pelvis

29860	Arthroscopy, hip, diagnostic; with or without synovial biopsy (separate procedure)
29861	Arthroscopy, hip, surgical; with removal of loose body or foreign body
29862	Arthroscopy, hip, surgical; with debridement/shaving of articular cartilage (chondroplasty), abrasion arthroplasty, and/or resection of labrum
29863	Arthroscopy, hip, surgical; with synovectomy
29914	Arthroscopy, hip, surgical; with femoroplasty (i.e., treatment of cam lesion)
29915	Arthroscopy, hip, surgical; with acetabuloplasty (i.e., treatment of pincer lesion)
29916	Arthroscopy, hip, surgical; with labral repair

Discussion

The most important finding of this study is that exposure to hip arthroscopy in graduating orthopaedic residents has remained low over the last 5 years, despite a significant increase in the total number of hip procedures performed per resident during this time. In addition, we found that about one third of graduating US orthopaedic residents performed 2 or fewer hip arthroscopy cases upon graduation.

Case logging of hip arthroscopy procedures was introduced by the ACGME in 2012. Since then, one study has examined hip arthroscopy case volume among US graduating orthopaedic surgery residents.[7] In 2012, residents performed an average of 0.9 hip

Table 2. The Demographics of Orthopaedic Surgery ACGME Case Log Respondents

Year	Total Number of Residency Programs	Total Number of Residents
2016	153	705
2017	156	709
2018	154	729
2019	154	725
2020	154	724

Table 3. Mean Number of Pelvis/Hip Arthroscopy Procedures per Graduating Orthopaedic Surgery Resident From 2016 to 2020

Procedure (Area)	2016		2017		2018		2019		2020			*P*
	Mean ±SD	Median (Range)	Mean ±SD	Median (Range)	Mean ±SD	Median (Range)	Mean ±SD	Median (Range)	Mean ±SD	Median (Range)	% Change	Value
Arthroscopy (pelvis/hip)	8.4±10	5 (0-87)	9 ±11	5 (0-76)	9.2±12	5 (0-109)	9.8±14	6 (0-173)	9.8 ±12	5 (0-101)	16.7%	.995
Total (pelvis/hip)	216.1±67	205 (80-487)	225.3±68	216 (78-625)	235.3±69	225 (107-541)	243.9±76	230 (93-553)	248.9±72	241 (104-552)	11.5%	**<.001**

arthroscopy cases, compared to 6.2 cases in 2013, representing a 588.9% increase. However, as this study only examined the percent change in case volume over a 1-year period, longitudinal data were difficult to examine. Our study is unique in that it offers an updated analysis of these data over a 5-year span, which also coincides with the growing national popularity of this procedure. We found that residents performed an average of 8.4 hip arthroscopy cases in 2016, compared to 9.8 in 2020. However, this increase was not significant, which implies that resident exposure to hip arthroscopy has plateaued during this time. Furthermore, compared to the data presented by Gil et al.,[7] present-day hip arthroscopy case volume among orthopaedic surgery residents has only increased by roughly 3 cases per year in nearly a decade.

Resident case volumes for hip arthroscopy do not seem to reflect the national rise in the incidence of this procedure. There has been a significant increase in the utilization of arthroscopic hip procedures over the last 2 decades.[12,20,21] Specifically, a 365% increase has occurred in the United States in recent years,[22] with a corresponding increase in the number of surgeons performing this procedure.[23] Hip arthroscopy has applications in several orthopaedic areas, including sports, hip and knee reconstruction, and pediatrics.[15] With improved surgical technique, expanding indications, and a growing understanding of prearthritic hip conditions,[24] such as intra-articular loose bodies, chondral injury, and femoroacetabular impingement (FAI) syndrome,[25] the demand for hip arthroscopy will likely increase.[23] As such, the importance of added exposure among orthopaedic surgery trainees is ever present.

A possible explanation for low resident case volumes for hip arthroscopy lies in the complexity of the procedure. Given its technical demand, hip arthroscopy procedures are often assisted by fellows compared to residents.[3] Gordon et al.[3] studied case log data for hip arthroscopy among orthopaedic surgery sports medicine fellows and reported a 310% rise in case volume from 2011 to 2016. An even greater increase (>600%) was found among the number of candidates taking the American Board of Orthopaedic Surgery Part 2 examination.[12] These results indicate that early-career orthopaedic surgeons and sports medicine fellows are continuing to gain exposure to hip arthroscopy.[3] In addition, lack of resident exposure to hip arthroscopy may be a consequence of reduced access, as not every residency program has a hip arthroscopist on staff. Furthermore, even at institutions with faculty who have hip arthroscopy training, surgical volume is widely variable and may be as low as low as 1 to 2 cases per year.

Although the ACGME has mandated case minimum requirements for knee and shoulder arthroscopy (30 and 20 cases, respectively),[3] no such guidelines have

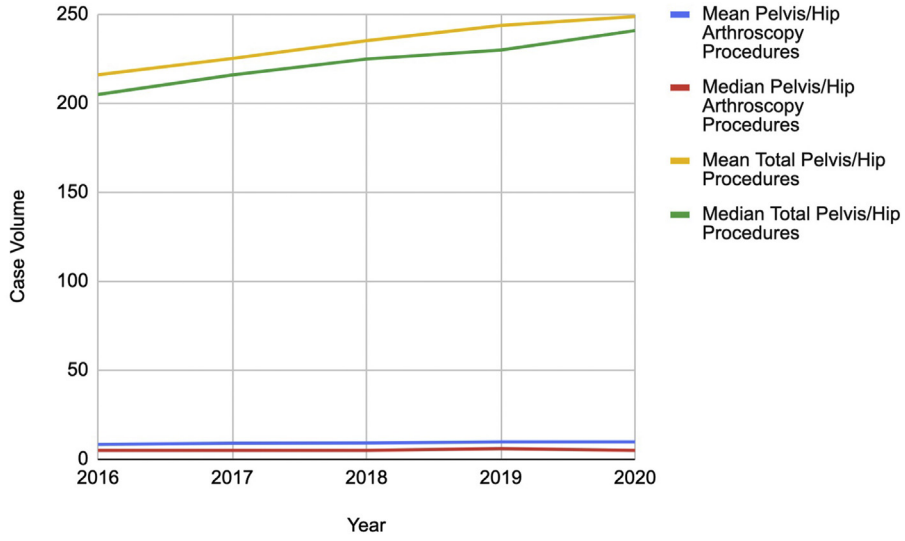

Fig 1. Mean and median orthopaedic resident case volume for pelvis/hip arthroscopy and total pelvis/hip procedures.

been implemented for hip arthroscopy. A recent systematic review on the learning curve associated with hip arthroscopy reported a wide spread of cutoff numbers to achieve procedural proficiency, ranging from 20 to more than 500 cases.[26] While expertise in hip arthroscopy is unachievable in residency alone, early procedural exposure may equip residents with a better understanding of the key surgical steps in hip arthroscopy.[27] Perhaps the implementation of an ACGME case minimum requirement may help to increase resident exposure to this increasingly popular procedure and better prepare trainees for fellowship and early practice.

Limitations

The present study is not without limitations. The ACGME case log data do not specify the types of procedures (or indications of said procedures) within the pelvis/hip category. Therefore, while overall case volume and variability for arthroscopic procedures of the pelvis/hip were provided, these findings are not applicable to specific CPT procedural codes. Next, the ACGME case log data accuracy may be influenced by bias due to underreporting or overreporting among residents.[28] This may be particularly evident when logging arthroscopic procedures that are associated with a variety of CPT codes. Finally, the degree of resident

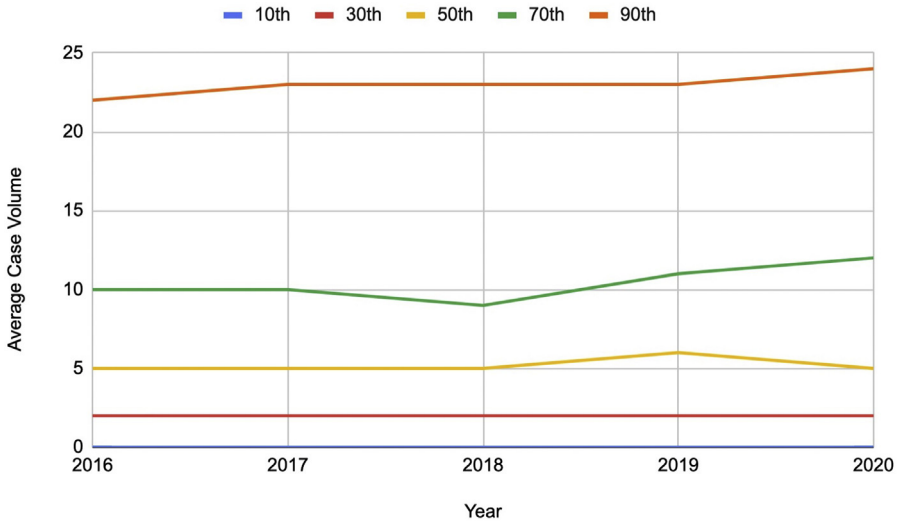

Fig 2. Mean case volume for pelvis/hip arthroscopy procedures in the 10th through 90th percentiles of orthopaedic residents.

Table 4. Fold-Difference in Pelvis/Hip Arthroscopy Procedures Between the 30th and 70th Percentiles of Graduating Orthopaedic Surgery Residents

Procedure (Area)	Year	10th	30th	50th	70th	90th
Arthroscopy (pelvis/hip)	2016	0	2	5	10	22
	2017	0	2	5	10	23
	2018	0	2	5	9	23
	2019	0	2	6	11	23
	2020	0	2	5	12	24
Total (pelvis/hip)	2016	141	178	205	240	299
	2017	148	186	216	251	314
	2018	157	195	225	263	331
	2019	157	200	230	272	347
	2020	164	207	241	280	347

participation within each case cannot be determined. Thus, resident case log data should not serve as a direct reflection of procedural proficiency.

Conclusions

Despite the growing popularity of hip arthroscopy, resident exposure to this highly technical procedure remains limited, with about a third of residents performing 2 or fewer cases upon graduation.

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